

REMARKS/ARGUMENTS

Claims 29-42 are pending. Claims 29, 32-34, 36, 37, and 39 have been amended to correct typographical errors and more fully protect the claimed invention. New claims 40 and 41 have been added. No new matter has been added to the amended or new claims. Applicants respectfully request reconsideration of the claims.

Claim Rejections - 35 USC § 112

Claim 36

Claim 36 was rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. (Office Action at page 4). Amended claim 36 recites, "The method of claim 29 wherein said SOI substrate is fabricated from a donor silicon wafer." This claim language finds support in the specification, for example, at page 4, lines 13-30. The Applicants believe this amended claim to be in condition for allowance.

Claim 37

Claim 37 was rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 37 has been amended for clarification purposes only. Amended claim 37 recites, in part, "wherein said surface is raised to a temperature of at least about 1,000° Celsius."

Claim Rejections - 35 USC § 103

Claims 29 and 31-38 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,251,754 to Ohshima et al. (hereafter Ohshima) in view of U.S. Patent 5,141,878 to Benton et al. (hereafter Benton) and an article by Moriceau et al. "Hydrogen annealing treatment used to obtain high quality SOI surfaces" (hereafter Moriceau).

Amended claim 29 is directed to a method of finishing SOI substrates. The claim recites, in part, "contacting said cleaved surface with a hydrogen bearing environment at least

when said temperature of said environment is about 1000° Celsius and greater to reduce said first surface roughness value by at least about eighty percent to a second surface roughness value, said hydrogen bearing environment including at least an HCl gas and a hydrogen gas.”

Ohshima discloses a method of manufacturing semiconductor substrates in which a high-temperature annealing step **P15** is carried out after an SOI substrate is detached from a base substrate (Ohshima at column 11, lines 36-56 and Figures 3 and 4D). As shown in Figure 4D, the defective layer **18** is characterized by a rough surface. The high-temperature anneal appears to cause “recovery of the defective layer at the detachment face, strengthening of the direct bonding, removal of surface oxides and flattening accompanying silicon flow.” (Ohshima at column 11, line 55).

Benton discloses the design of an integrated photodiode for silicon monolithic integrated circuits and a method for making the same. (Benton at column 1, lines 1-10). Figure 2 of Benton shows schematically, the etching of a deep tub **13**. “The result of the tub-forming step is schematically illustrated in FIG. 2A which shows in schematic cross section, the substrate **10**, an epitaxial layer **11**, the oxide outer layer **12** and tub **13** with smooth side walls 14A and 14B and bottom wall 14C.” (Benton at column 2, lines 31-35). Prior to the epitaxial growth of a p-n junction in the deep tub, a five minute “high temperature pre-bake and HCl-H₂ gas etch” is performed “to reduce native oxide films and to further smooth the bottom and side walls of the tub.” (Benton at column 2, lines 49-51).

Benton, as noted above, is directed to formation of silicon photodiode, which is a different field of technology from that of Oshima, which is related to wafer-level technology. Forming a “deep tub” on the substrate, as required in Benton, accordingly, is contrary to the Oshima that is directed to planarizing the substrate. There is no motivation to combine Oshima and Benton. The only motivation, if any, derives from the claims of the present application, particularly since Applicants note that Benton describes its step as an “etch step” not a smoothing or planarizing step.

It is well settled law that one cannot use hindsight to reconstruct the claimed invention by picking and choosing features from prior art. “The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious

unless the prior art suggested the desirability of the modification...It is impermissible to use the claimed invention as an instruction manual or "template" to piece together the teachings of the prior art so that the claimed invention is rendered obvious. This court has previously stated that "[o]ne cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention." In re Fritch, 23 USPQ 2d 1780, 1783-84, (Fed. Cir. 1992).

The third piece of prior art cited by the examiner was the article by Moriceau in which a hydrogen annealing treatment is used on SOI surfaces. The examiner contends that Moriceau provides the degree of surface roughness reduction not indicated in Ohshima. (Office Action at page 5). The Applicants respectfully traverse the combination of Moriceau with Ohshima for at least the following reasons.

The Applicants respectfully submit that Moriceau only discloses the use of a hydrogen annealing environment and therefore does not teach or suggest the use of a "hydrogen bearing environment including at least an HCl gas and a hydrogen gas" as recited, in part, in amended claim 29. The hydrogen annealing environment disclosed by Moriceau is fundamentally different from the environment of the present embodiment.

Additionally, the results produced by Moriceau's method differ significantly from those of the present embodiment. Although the examiner correctly noted that the reduction in surface roughness shown in Figure 1 of Moriceau bears a relation to the method of the present embodiment, in which the surface is substantially planarized, other results are markedly divergent. Moriceau discloses that the hydrogen anneal produces 1) a thinning of the superficial silicon layer, 2) the production of "long and narrow crystalline terraces," and 3) the production of "a lot of small pits." (Moriceau at page 37). These divergent results support the Applicants' contention that the method disclosed by Moriceau does not serve as a useful point of comparison to that of the present embodiment. Based on at least these reasons, the Applicants respectfully submit that there is no motivation to consider the results produced by the hydrogen annealing process disclosed by Moriceau as relevant to the present embodiment.

Claim 30-39, which depend on claim 29 are believed to be in condition for allowance for at least these reasons, and others.

Claim 30

Claim 30 was rejected under 35 U.S.C. 103(a) as being unpatentable over Ohshima in view of Benton and Moriceau and in further view of an article by Tate et al., "Defect reduction of bonded SOI wafers by post anneal process in H₂ ambient." Claim 30 recites, in part, "increasing the temperature [] at a rate of about 10 Degrees Celsius per second and greater."

Although Tate discloses the use of a rapid thermal anneal (RTA) process to perform defect reduction, Tate does not teach or suggest the use of a H₂ anneal "to reduce said first surface roughness value" as recited, in part, in amended claim 29, on which claim 30 depends. Tate does not teach or suggest that there is a correlation between defect reduction and surface smoothness.

Claim 39

Claim 39 was rejected under 35 U.S.C. 103(a) as being unpatentable over Ohshima in view of Benton and Moriceau and in further view of U.S. Patent 6,355,269 to Sato. The Applicants respectfully traverse the use of Sato as prior art.

Sato does not serve as prior art since the Applicant's priority date of April 21, 1999 precedes both the U.S. filing date of September 3, 1999 and the publication date of January 1, 2002 for U.S. patent 6,335,269 to Sato.

New Claims

New claims 40 and 41 have been added to more fully protect the claimed invention. Claims 29-42 are pending. Claims 29, 32-34, 36, 37, and 39 have been amended to correct typographical errors and more fully protect the claimed invention. New claims 40 and 41 have been added. No new matter has been added to the amended or new claims. Applicants respectfully request reconsideration of the claims.

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New Claims

New claims 40 and 41 have been added to more fully protect the claimed invention.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,



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